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भारतीय मानक

खदान ढुलाई उपस्कर — सीधे रस्से वाले (50 से 150 किवॉ) — सामान्य अपेक्षाएं

Indian Standard

MINE HAULAGES — DIRECT ROPE (50 TO 150 kW) — GENERAL REQUIREMENTS

UDC 622·625·5·05

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

January 1993 **Price Group 2**

Mine Transportation Sectional Committee, HMD 8

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Mine Transportation Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council.

At present different types of haulages are used extensively in mines, in India. A need has, therefore, always been felt to rationalize some of the basic and broad features of a direct rope haulage for operational advantages and to promote safety.

This standard is expected to provide a uniform practice to the manufacturers and users for adoption of basic and broad features of direct rope haulage.

The direct rope haulage shall also meet the requirements not given in this standard but specified by any statutory body or otherwise.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

MINE HAULAGES — DIRECT ROPE (50 TO 150 kW) — GENERAL REQUIREMENTS

1 SCOPE

This standard covers general requirements of direct rope haulages of capacities from 50 kW to 150 kW for transporting minerals materials in mines.

2 REFERENCES

The following standards are necessary adjuncts to this standard:

IS No.	*Title*
1856 : 1977	Steel wire ropes for haulage purposes (*second revision*)
3682 : 1966	Flame proof alternating current motors for use in mines
9559 : 1986	Guide for selection of electrical and electronic equipment for coal mines

3 GENERAL REQUIREMENTS

Besides statutory and other specific requirements the direct rope haulage for transporting minerals/materials in mines shall conform to the requirements given in **3.1** to **3.2.3.1**.

3.1 Mechanical Details

3.1.1 The rating and other parameters shall be as given in Table 1.

Table 1 Rating and Other Mechanical Parameters

Rating of Haulage, kW	**50**	**75**	**100**	**150**
Rope dia, mm	19	22	25	25
Drum dia, mm	1 000	1 200	1 500	1 500
Drum width, mm	900	1 000	1 200	1 200
Flange dia, mm	1 400	1 600	1 950	1 950
Rope capacity of drum, in metres, upto	750	800	1 100	1 100
Motor power, kW	50	75	115	150
Maximum motor speed (syn), rev/min	1 500	1 000	1 000	1 000
Maximum static rope pull, kN	25	30	40	40
Rope speed, m/s	1·5/1·8	2·0/2·2	2·5/2·7	3·4/3·6

3.1.2 Direct rope haulage shall be provided with service brake as well as the emergency brake. However in haulages of 50 kW and 75 kW rating, only service brake may be provided. The emergency brake shall have the braking capacity of 3 times the maximum static torque and the service brake shall have a braking capacity of 1·2 times the static torque.

3.1.3 Direct rope haulage shall also be provided with distance indicator.

3.1.4 A jaw clutch shall not be provided in the haulage as its incorporation in the system would not be in line with the safety features mentioned above and as such this may unnecessarily complicate the mechanism. The motor shall run with power 'ON' while the tubs are being lowered. The absence of clutch would help to keep the lowering speed within limits.

3.1.5 The design of the direct haulage shall be such that frame and all the components can be easily dismantled without much difficulty for transporting and maintenance in the mine.

3.1.6 The rope used with the direct rope haulages shall conform to IS 1856 : 1977.

3.1.7 The rope fixing shall be on the drum periphery and not on the flange of the drum.

3.2 Electrical Details

In general, the electrical equipment for direct rope haulages shall be selected in accordance with IS 9559 : 1986.

3.2.1 The selection of electricals shall be determined mainly on the basis of duty cycle of haulage operation and condition of installation and operation and may include consideration for the following:

a) Slow speed running and its duration,

b) Number of start-stop and inching operation in each cycle and in each stage of operation,

c) Over loading and its duration,

d) Over speed running and its duration,

e) Total duty cycle with acceleration and retardation time.

f) Braking or plugging, if any, and

g) Ambient and environmental condition.

h) Thermal characteristics curves of the motor.

3.2.2 Selection of drive may include the following consideration.

a) Slipring or squirel cage motor to be determined as per the requirements of haulage installation. Also the type of enclosure namely TEFC or FLP may be selected as the case may be for the requirement of haulage and its installation condition.

b) Output, voltage, speed and torque according to the requirements of haulage and available power supply system.

c) Duty of the drive with considerations for the parameters mentioned in **3.2.1.**

d) The motor shall conform to the requirements of IS 3682 : 1966 and shall have class of insulation corresponding to minimum 80°C temperature rise. The motor shall also conform to at least the following other requirements:

   1) 200 percent over speed for 5 minutes;

   2) 15 to 20 numbers of inching operation in each cycle during acceleration and slow speed running;

   3) Slow-speed running for one-third period of duty cycle at one-third of rated speed on full load;

   4) Duty cycle 10 minutes and pause of 2 to 3 minutes;

   5) Acceleration time 1 minute and retardation time 10·3 seconds; and

   6) 50 percent overload for 1 minute continuous operation.

3.2.2.1 The selection of rotor resistance and its number of steps shall be determined considering speed-torque requirement of haulage and drive motor rotor data. The duty factor shall be determined from actual duty cycle of haulage and duration of operation in each step. Further it shall conform to at least the following requirements;

a) 30 percent speed and 35 percent torque at first notch; for inspection speed,

b) 30 percent speed and 60 percent torque at second notch; for slow speed running,

c) 30 percent speed and 100 percent torque at third notch; slow speed running to cope with sharp bend and underwelling in track,

d) 100 percent duty factor of first, second and third notch,

e) 20 percent duty factor for fourth and onward notch for acceleration,

f) Maximum developed torque shall not be more than 250 percent and minimum not less than 180 percent (from fourth notch and onwards),

g) Maximum permissible temperature rise of resistance box shall not be more than 70°C,

h) The resistance unit shall be shock proof, vibration proof and rust proof. Suitable torque-speed characteristics for rotor resistance shall be adopted,

j) Maximum unbalance motor resistance, if selected, shall be restricted to 150 percent of normal full load current,

k) Fully enclosed or FLP construction, and

m) The design and construction of the enclosure shall be such that during operation of resistance units, heat dissipation takes place and appropriate rate from its body.

3.2.2.2 If liquid rheostat is used, the following additional protection shall be taken care of:

a) Open type liquid rheostat shall not be used,

b) Low electrolyte level protection

c) Provision to check concentration of electrolyte,

d) Provision of adjustment of electrodes at maximum position when semi-master controller is in 'OFF' position,

e) Sufficient cooling arrangement for cooling the electrolyte,

f) One contractor shall be provided for shorting the rotor of motor when semi-master controller is in fully 'ON' position, and

g) Provision shall be made for desealing. Arrangement shall also be made for periodic checking and prevention of sealing.

3.2.3 The following basic elements/features shall be considered while selecting the control gear:

a) Supply isolation device (with reversing and interlocking),
b) Forward-reverse operating device with the mechanical and electrical interlocking,
c) Short circuit protection (preferably with ACB),
d) Overload protection (preferably magnetic Oil dashpot type),
e) Under voltage protection,
f) Earth leakage protection,
g) Over speed protection,
h) Over travel protection,
j) Current, voltage and speed indicator,
k) 'ON' 'OFF' and earth leakage indicator,
m) Earth leakage test and re-set arrangement,
n) 'OFF' position mechanical and electrical interlocking of drum controller/master controller/semi-master controller,
p) Circuit for emergency brake,
q) Emergency stop push button,
r) Environmental conditions, and
s) Motor shall be controlled by a switch gear to disconnect automatically the supply in the event of conditions of single phasing, over voltage and over current.

3.2.3.1 Further the control gear shall conform to at least the following requirements:

a) Operating line contactor shall be of AC-4 duty class and handling of motor line current by drum controller to be restricted as far as possible,
b) Matching and minimum setting characteristics of over current relay, circuit breakers and line contactors shall be provided, and
c) Operation of haulage, during lowering shall be made with power supply to motor 'ON'. Lowering under gravity shall be prohibited during normal use.

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